

**United States Naval Academy
Mechanical Engineering Department**

EM318 Applied Fluid Mechanics

Catalog Description: EM318 Applied Fluid Mechanics **Credit:** 3 (3-0-3)

A first course in incompressible fluid mechanics. Topics include properties of fluids, fluid statics, integral conservation equations, differential field analysis, dimensional analysis and similitude, incompressible boundary layers, viscous flow in conduits and flow about immersed bodies. [fall, spring]

Prerequisites: SM212

Corequisites: EM319 or equivalent.

Textbooks: E. John Finnemore and Joseph B. Franzini, Fluid Mechanics, Tenth Edition, McGraw-Hill

Course Director: Associate Professor Karen A. Flack

Objectives 1:

1. To teach students the fundamentals of fluid properties, fluid statics and fluid dynamics with applications to a broad range of problems.^{a,b}
2. To teach students the fundamentals of fluid topics related to naval applications ^{a,b,c}
3. To demonstrate fluid phenomena through experimentation and design, and the methods of experimental dimensional analysis.^{a,b}
4. To teach students the mathematical tools necessary to solve complex fluids problems.^{a,c}

Course Content:

No.	Topic or Subtopic	hrs.
	Fluid Properties	3
	Hydrostatics	4
	Buoyancy / Stability	1
	Conservation of Mass	2
	Conservation of Momentum	4
	Conservation of Energy	4
	Similitude and Modeling	2
	Pipe Flow	5
	Pumps	2
	Open Channel flow	2
	Boundary Layers	2
	Pressure Drag and Lift	2
	Laboratory Demonstrations	4

Evaluation:

1. Quizzes	___ Yes	___ No
2. Homework	___ Yes	___ No
3. Exams	___ Yes	___ No
4. Laboratory reports	___ Yes	___ No
5. Oral Presentations	___ Yes	___ No
6. Design Reports/Notebooks	___ Yes	___ No
7. Prototypes/Demonstrations	___ Yes	___ No
8. Projects	___ Yes	___ No
9. Any other evaluation tools used	___ Yes	___ No

Acquired Abilities²:

1.1 Students will demonstrate an understanding of fluid properties including the measurement of the property and its dependence on pressure and temperature. (1,2,3,4)

1.2 Students will demonstrate the ability to solve hydrostatic problems involving manometers, hydrostatic forces on planar and curved surfaces, and hydraulics. (1,2,3,4)

1.3 Students will demonstrate the ability to solve fluid dynamic problems involving conservation of mass, momentum, and energy for viscous and inviscid flow. (1,2,3,4)

2.1 Students will demonstrate the understanding the naval related topics of ship stability, aerodynamics, turbomachinery and fluid transport. (1,2,3,4)

3.1 Students will demonstrate and understand dimensional analysis used in fluids experiments. (1,2,3,4)

Date of Latest Revision: 10 January 2003

¹ Letters in parenthesis refer to the [Program Objectives](#) of the [Mechanical Engineering Program](#).

² Numbers in parenthesis refer to the evaluation methods used to assess student performance.